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number : NC08002 date : 17-04-1980

title : a Wide-band amplifier with th BFR90A & BFR91A

author : H.van Hees

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Electronic Components and Materials Division
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laboratory report

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NIJMEGEN – THE NETHERLANDS

REPORT No: NCO 8002
PROJECT No:

AUTHOR: H. v. Hees

DATE: 17.04.1980

TITLE

A wide-band amplifier with the BFR 90 A and BFR 91 A

ABSTRACT

The two stage MATV wide-band amplifier (40-860MHz) described in report NCO 7304, has been re-designed. The BFR 90 and BFR 91 transistors have been replaced by their low noise versions BFR 90 A and BFR 91 A.
The results are:

- 0.3dB higher gain
- 1dB lower noise
- 2dBμV higher V_o
- 7dB better d_2 properties.

J. Tuil

Advice Patents Dept. d.d: 1980-06-30	X AV	GV		B		BL	
Decision MAMO d.d: 1980-06-16	X AV	X GV	Ex	B		BL	
DATE: 16 JUNI 1980	MAMO:						

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SUMMARY

In the two stage MATV wide-band amplifier, described in report NCO 7304, the following mutations have been carried out:

- the BFR 90 and BFR 91 transistors have been replaced by the BFR 90 A and BFR 91 A.
- the BFR 91 A has been set at V_{CE} = 8V (BFR 91 at 5V).
- the capacitance over the emitter resistor of the first stage and the inductance in the shunt feedback of the second stage have been removed.
- the output capacitance has been decreased from 1.2pF to 1pF.

Fig. 1 shows the final circuit and table 1 the results.

table 1 Results

40-860MHz		amplifier BFR 90/91	amplifier BFR 90 A/91 A
gain	dB	16.7±0.2	17.0±0.2
return losses	dB	> 9.5 (VSWR < 2)	⩾ 9.5 (VSWR ⩽ 2)
noise figure	dB	6.4-6.8	5.3-5.8
V_o at -60dB intermod. acc. DIN 45004 B	dBµV	⩾ 106	⩾ 108
d_2 at V_o = 48dBmV	dB	⩽ -38	⩽ -45

Advice Patents Dept. d.d: 1980-06-30	AV X	GV		B		BL	
Decision MAMO d.d: 1980-06-16	AV	GV	RI	B		BL	
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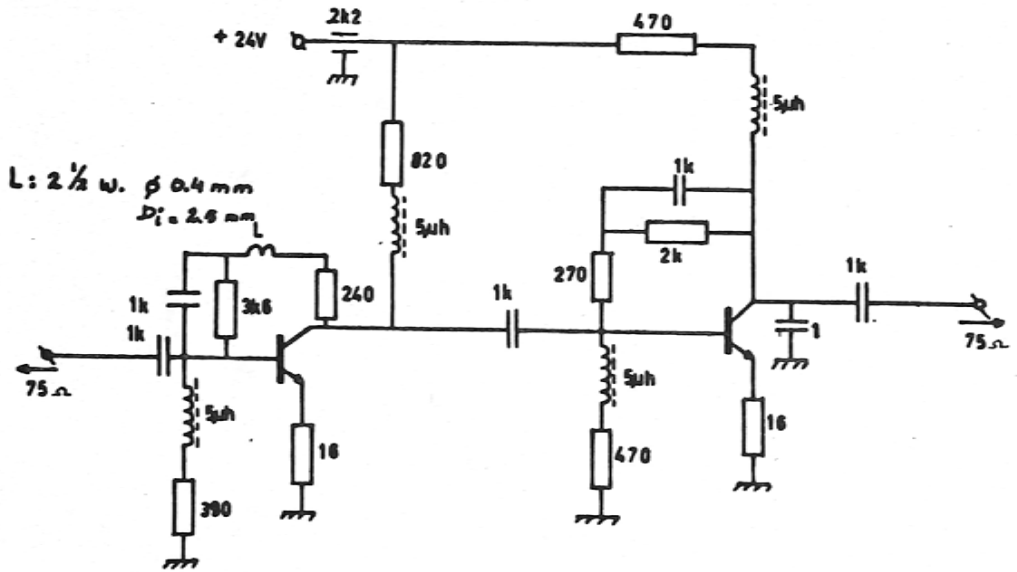

BFR 90A

14 mA.
10 V.

BFR 91A

30 mA
8 V

Fig. 1 Circuit.

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1. Introduction

The BFR 90 A and BFR 91 A are low noise replacement types of the BFR 90 and BFR 91 transistors.

In the amplifier with the BFR 90 and BFR 91, described in report NCO 7304, we have replaced these transistors by their A types.

2. Circuit

We had to modify the circuit of report NCO 7304 because the gain at high frequencies was too high. We removed the capacitance over the emitter resistor of the first stage and also the inductance in the shunt feedback of the second stage. For good return losses the value of the output capacitance has been lowered from 1.2pF to 1pF.

Fig. 1 shows the modified circuit.

The DC adjustment is tabulated below.

	I_E (mA)	V_{CE} (V)
BFR 90 A	14	10
BFR 91 A	30	8

3. Measurements

The measurring results of the gain, return losses, output voltage V_o at -60dB intermodulation (DIN 45004), second order distortion d_2 and the noise figure are in the figs. 2, 3, 4, 5 and 6. The dotted curves are the results of the BFR 90/91 amplifier.

4. Conclusions

The modification of the amplifier has improved the performance as you can also see in the table below.

	V_o (dBµV)		d_2 (dB)		NF (dB)	
	100MHz	800MHz	100MHz	800MHz	100MHz	800MHz
modified BFR 90 A/91 A	110.5	108	-50	-45	5.3	5.8
NCO 7304 BFR 90/91	110	106	-48	-38	6.4	6.8

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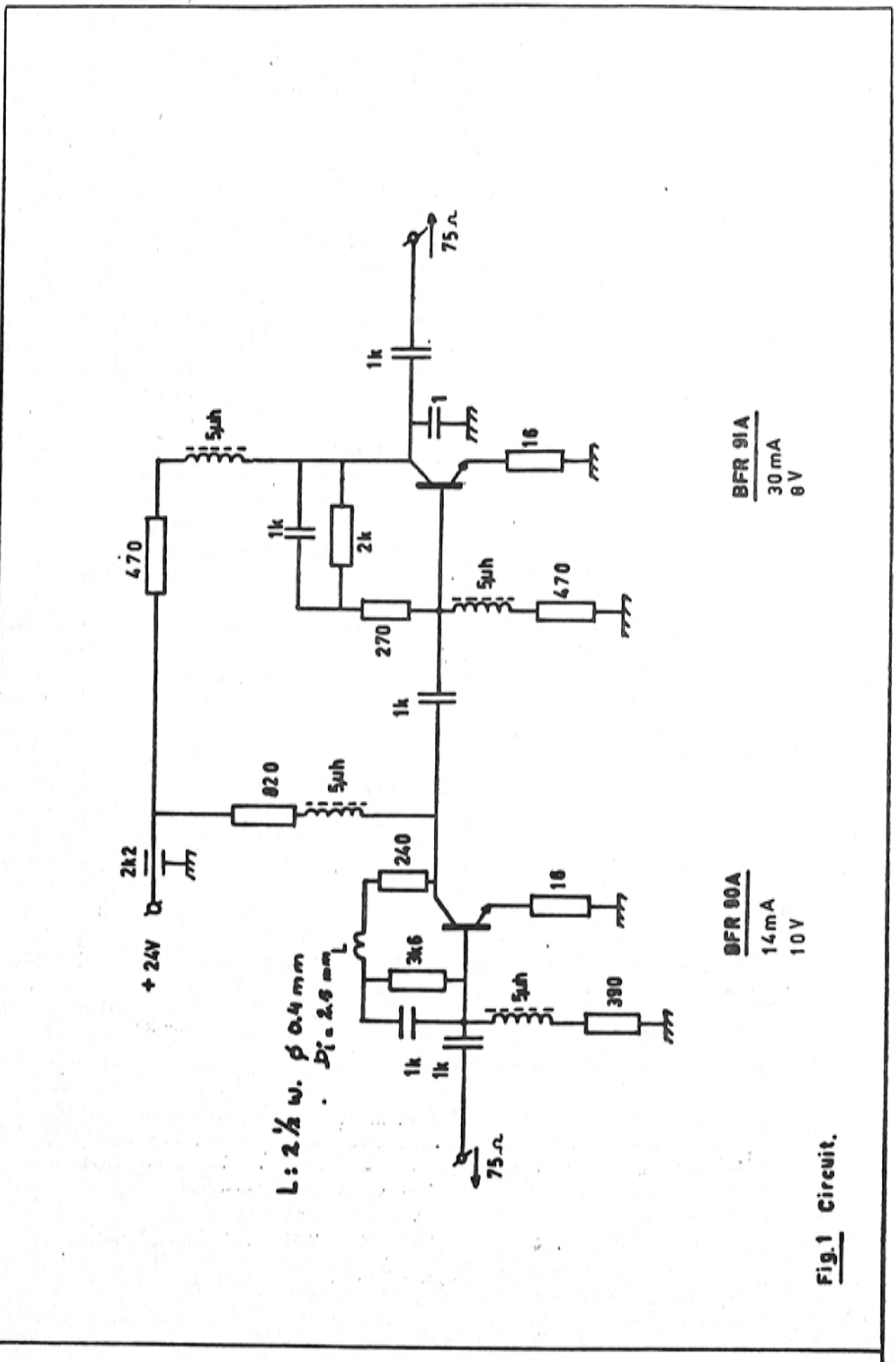

Fig.1 Circuit.

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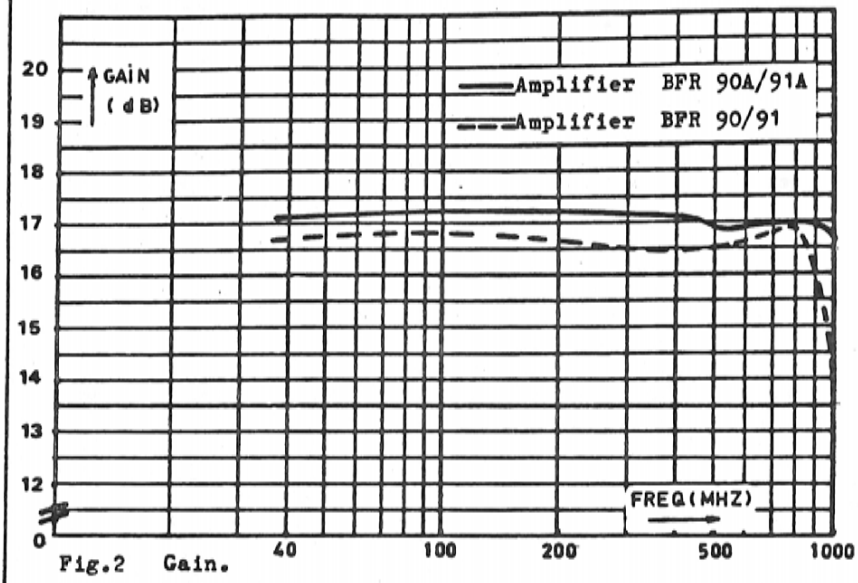
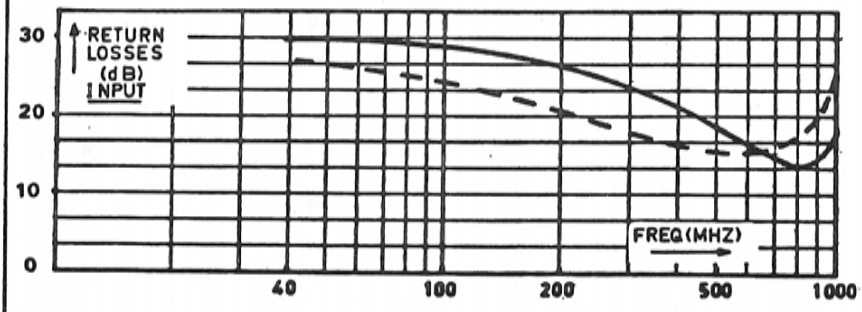


Fig.2 Gain.



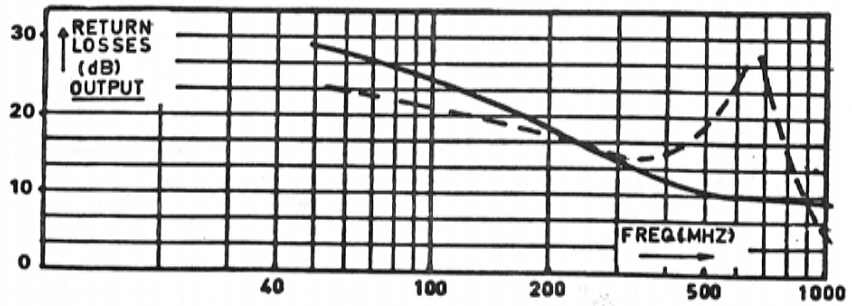


Fig.3 Return losses.

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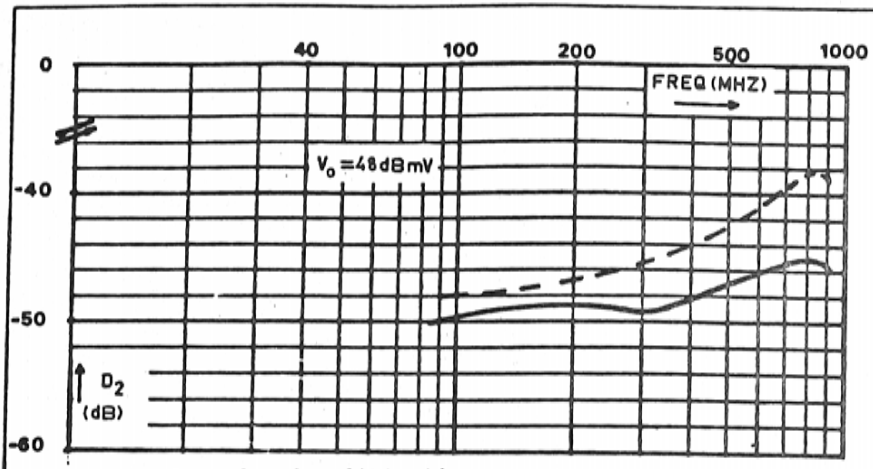

Fig.4 Second-order distortion.

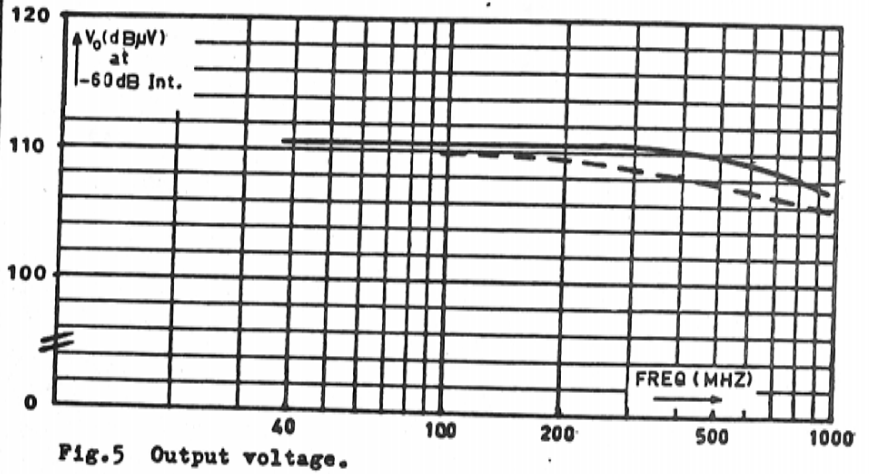

Fig.5 Output voltage.

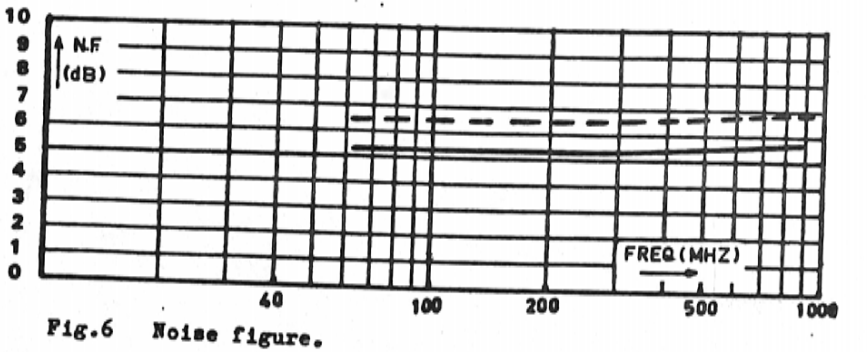

Fig.6 Noise figure.

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